FINAL REPORT

DESIGN OF AN AUTOM... SCREW-DOWN FOR A HIGH SPEED COMPRESSION-TESTING MACHINE

PREPARED FOR

Canada Centre for
Mineral and Energy Technology,
Energy, Mines and Resources, Canada

PREPARED BY

W.R. Davis Engineering Limited
Consulting Engineers
Ottawa, Ontario

DSS FILE NO: 26SQ.23440-3-9011
DSS CONTRACT SERIAL NO: 0SQ83-09021
CANMET PROJECT NO: 370032
DE FILE NO: C83-56

32 pp

MICROMEDIA

NOVEMBER 1983

MICROMEDIA

TABLE OF CONTENTS

		PAGE
EXECUTIVE SUMMARY		i
SOMMAIRE		ii
1.0	INTRODUCTION	1
2.0	DETAIL DESIGN	2
3.0	SET-UP PROCEDURES	3

APPENDIX - Manufacturers' Component Specifications

EXECUTIVE SUMMARY

The Physical Metallurgy Research Laboratories of the Department of Energy Mines and Resources specified a requirement for a modification to their compression testing machine that would maintain constant sample contact between strikes.

Davis Engineering has supplied a detailed design for a pneumatically operated wedge take-up system to answer their needs. The probability of success for the design is considered high.

Sommaire

Le Laboratoire de Recherches en Métallurgie Physique du Ministère de l'Energie, mines et ressources requiert courramment une modification à leur appareil d'essais de la résistance des matériaux aux contraintes compressives. Cette modification durait pour but le maintient d'un contact ininterrompu entre l'échantillon et l'actuateur lors impacts répétitifs.

Afin de réspondre à ce besoin, Davis Engineering a fourni un concept détaillé d'un système incorporant une cale glissante. La probabilité du succès de ce concept est considerée élevée.

1.0 INTRODUCTION

Under the terms of a contract through DSS (File No. 26SQ.23440-3-9011), Davis Engineering was retained by the Physical Metallurgy Research Laboratories of the Department of Energy, Mines and Resources to provide a detailed design for a modification to a high speed compression testing machine that would maintain constant sample contact.

In an interim report dated June 1983, Davis Engineering presented two conceptual designs that would meet the requirements. The client selected the Wedge Take-Up System as the one offering the greatest probability of success, and Davis Engineering then turned to producing a detailed design.

This report describes additional details of the system and offers some guidelines for its commissioning. Manufacturers' specifications of major components are contained in the appendix of this report and a drawing package is provided under separate cover.

2.0 DETAIL DESIGN

The detail design of the system is generally in accordance with the conceptual design previously presented with the following exceptions:

(a) The original specification called for a total vertical travel of 1". With the half angle of 7 degrees selected for the wedge, this required an actuator stroke of 4". The actuator stroke has been increased to 5" in the final design to allow for the inclusion of a cushion in the cap end. This cushion reduces the likelihood of damage to the actuator should the operating valve be inadvertently activated when the wedge is not restrained. The additional 0.23" of vertical travel produced by the extra stroke length should not be used in testing because the cushion limits the acceleration and hence degrades the performance.

(b) The clevis mount previously proposed has been replaced by a mid-trunnion mount. This reduces the side loads on the rod bearing during the rapid vertical accelerations of the rod end.

(c) At the request of the client, a solenoid controlled operating valve has been substituted for the push-button valve previously specified. The valve chosen has a push-button override for test purposes. Wiring of this valve is the responsibility of the client.

(d) The flow control valve has been relocated to the exhaust port of the operating valve. The rod extension rate (or return rate of the wedge) is set by the flow control valve.

3.0 SET-UP PROCEDURES

The following suggestions are provided to serve as a general guide only in the set-up and testing of the wedge take-up system. The system should never be operated by persons not completely familiar with it and should never be operated without the safety cover in place.

- After system has been assembled in accordance with the assembly drawing, check all connections, joints, and fasteners for tightness.

- Ensure shut-off valve is closed and regulator set to 0 before making connection to client's air supply. Operating valve should be de-energized.

- Set precharge in accumulator to zero.

- Close Flow control valve completely then open valve ¼ turn CCW.

- Partially retract piston by hand and lower positioning screw to apply as much force as possible and confirm wedge is self-locking. If wedge slips, disconnect actuator. Return spring force may be high compared to the manually applied vertical force. If wedge still slips, check for presence of lubricant or incorrectly machined surfaces on the wedge and punches. Clean or re-machine as necessary.

- Open shut-off valve and raise regulator pressure to 15 psi. Check manual and electrical control of operating valve. Adjust flow control valve if necessary.

- With operating valve energized, slowly raise pressure to 90 psi and leak check all pneumatic connections with a soap solution.

> **WARNING**
>
> Wear safety glasees at all times.
>
> Keep clear of operating mechanism. A loss of signal to the valve could result in rapid retraction.

- Reduce regulator pressure to zero and when gauge at accumulator reads zero, de-energize valve. Actuator will extend.

- Set regulator pressure to 50 psi and place sample in position. Lower positioning screw to make firm contact with sample. Energize or manually open operating valve and carry out one test cycle. Release valve and set pressure to zero. Inspect cam and punches for abnormalities.

- Through experimentation, determine the minimum regulator pressure required (up to 90 psi) to maintain sample contact. This may be ascertained by sound or by load cell output displayed on a storage scope.

- Precharge accumulator to 70% of regulated pressure. Monitor accumulator gauge for sudden pressure drops during test cycles that would indicate bottoming of the diaphram. Lower precharge if bottoming occurs.

- Inspect wedge and punches frequently to determine wear rate and necessary servicing intervals.

- Inspect piston rod for deformation.

WARNING

Never use a wedge or punch that is chipped, cracked, or damaged in any way.

WARNING

Never lubricate wedge or punch mating surfaces.

- Periodically check trunion mounts for excessive wear. Lubricate as necessary.

- Keep lubricator filled with oil to manufacture's specifications.

APPENDIX

MANUFACTURERS'

COMPONENT SPECIFICATIONS

Parker Series P High Performance Air Cylinders

Get Parker quality in a compact, lightweight, round cylinder

- Pneumatic to 150 psi
- Bore sizes: 1⅛, 1½, 2, 2½, 3, 4 inches
- Double-acting and spring-return
- Cushions optional at either or both ends
- Universal nose and tang mounts
- Temperature range:
  Standard seals −10°F to 165°F
  Hi-Temp* Seals −10°F to 300°F

*Seals are satisfactory for use at higher temperatures (300° to 500°F) when cylinder is operated at reduced working pressures.

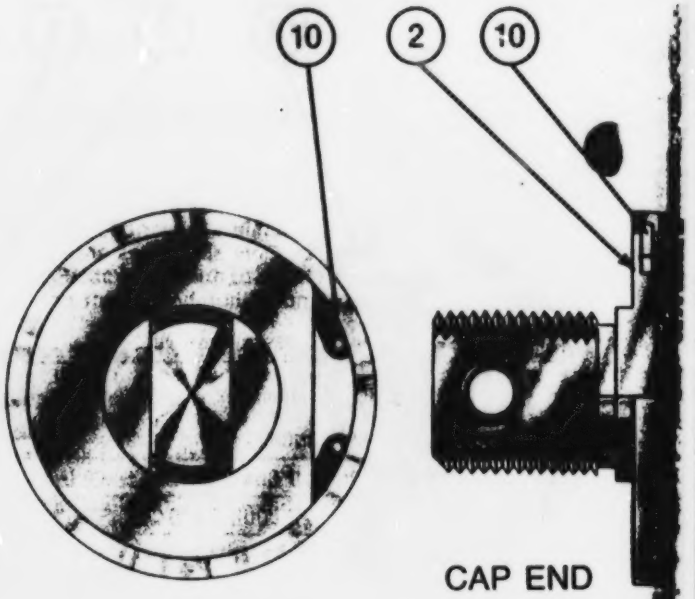
- single-acting, spring-return models
- Double-acting models:
  Model P O-ring piston, single rod
  Model PL Lipseal® piston, single rod
  Model KP O-ring piston, double rod
  Model KPL Lipseal® piston, double rod
- Standard stroke lengths to 20 in. in one inch increments, plus 1½, 2½, 3½ inch strokes.

FORCE DATA

(TO DETERMINE FORCE MULTIPLY OPERATING PRESSURE BY AREA FIGURES BELOW)

BORE SIZE	ROD DIA.	MAJOR AREA (SQ. IN.)	MINOR AREA (SQ. IN.)
1⅛"	⅜"	.992	.882
1½"	½"	1.766	1.570
2"	⅝"	3.141	2.835
2½"	¾"	4.906	4.464
3"	¾"	7.065	6.623
4"	1"	12.560	11.775

Max. Operating Pressure 150 PSI Pneumatic Service.



CAP END

features

(1)(2) **HEAD AND CAP.** heat-treated aluminum for light weight. Cap provided with steel bushing pivot for pin.

(3) **CYLINDER TUBE.** Heat-treated aluminum for light weight—hard-anodized inside and out for corrosion and abrasion resistance. Smooth I.D. finish for long seal life.

(4) **PISTON.** Heat-treated aluminum available with O-ring seal or Lipseal® type for air service.

(5) **PISTON ROD.** Case hardened and chrome plated steel (except ⅜" dia. is stainless steel.) Full diameter threads for maximum strength. Wrench flats are standard.

(6)(7) **CUSHIONS.** Adjustable cushions are optional on 2, 2½, 3, and 4 in bore sizes. Fixed cushions are optional on 1⅛ and 1½ in. bore sizes. Cushions may be ordered, at an extra price, at both ends or head or cap end only, with no change in envelope dimensions. When cushioned, Series P cylinders are supplied with cushion sleeves on piston rod; and cushion seal checks in head or cap for positive cushioning, with free fluid flow for quick stroke reversal.

(8) **CUSHION ADJUSTMENT.** Safety cushion adjustment needle is recessed and retained to eliminate the hazard of being blown out during adjustment. This unique safety feature is standard on Series P cylinders with bore sizes of 2, 2½, 3, and 4 inches.

(9) **ROD SEAL.** Wear-compensating design conforms to pressure variations and provides maximum seal life.

(10) **RETAINING RING.** High strength (210,000 psi ultimate) steel snap ring, precision made to securely lock head and cap to cylinder tube. Easily removed for quick disassembly.

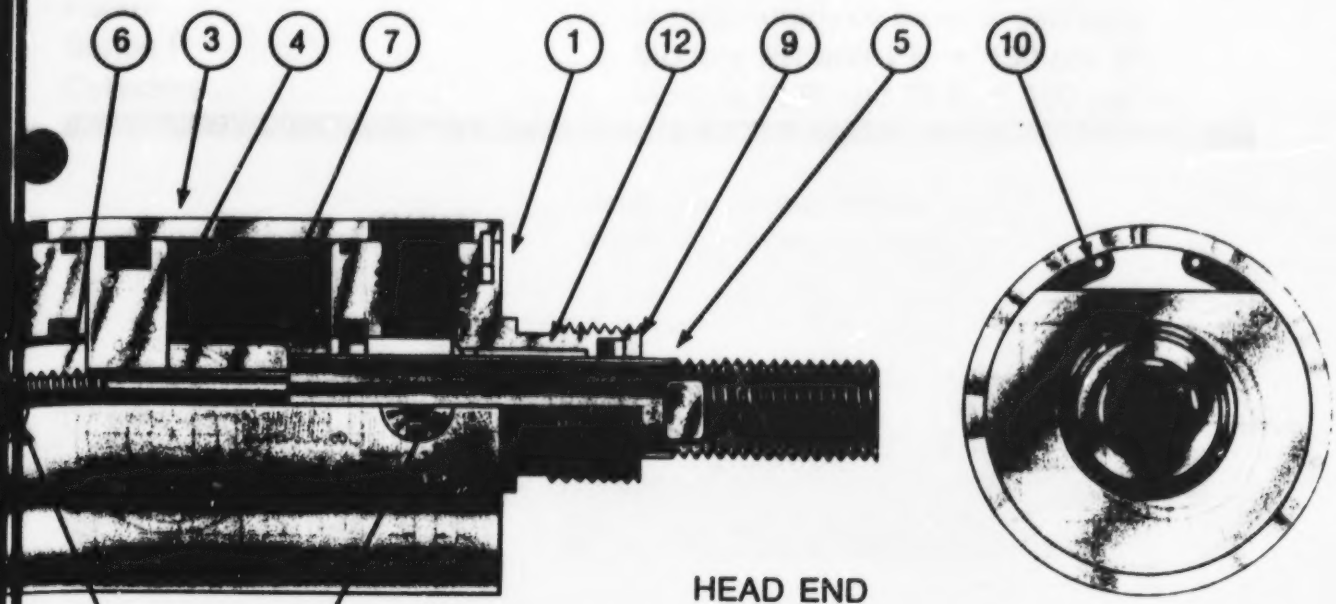
(12) **ROD BEARING.** Low friction bronze bearing for high performance under standard operating conditions. Filled Teflon® available for high temperature operation.

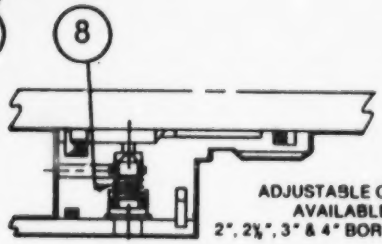
SEALS. Series P cylinders are supplied with Buna-N synthetic rubber seals as standard for air service; and for temperatures from −10°F to 165°F. For operation at temperatures to 300°F, Viton seals are available at extra price.

STANDARD STROKES. 1 through 20 inches in one-inch increments, plus 1½, 2½ and 3½ inches. Fractional strokes and strokes over 20 inches available to order.

Parker Cylinder Division
501 So. Wolf Road
Des Plaines, IL 60018
Regional Plants
• Atlanta, GA 404/349-0883
• Chicago (Des Plaines), IL 312/298-2400
• Cincinnati, OH 513/793-3500
• Des Plaines, IL 312/298-2400
• Plymouth, MI 313/455-1700
• Portland, OR 503/211-0182
• Saddle Brook, NJ 201/791-7408
• Santa Fe Springs, CA 213/[illegible]
• Sebring, OH 216/938-9191
• Owen Sound, Ont. Can. 519/376-2681

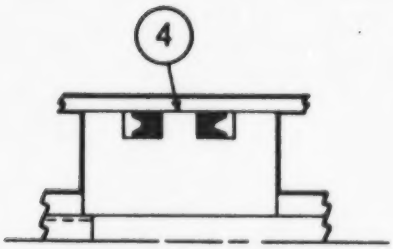
Parker Fluidpower





ADJUSTABLE CUSHION AVAILABLE ON 2", 2½", 3" & 4" BORE SIZES ONLY

FIXED CUSHIONS AVAILABLE ON 1½" & 1¾" BORE SIZES



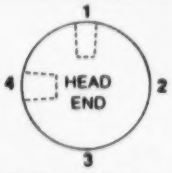
ALTERNATE LIPSEAL PISTON MODEL PL

HOW TO ORDER SERIES P CYLINDERS

When ordering Series P cylinders, specify each of the following: 1) Bore size. 2) Basic model number (see chart below). 3) Piston style O-ring or Lipseal. 4) Cushions (if required), specify head end, cap end, or both ends. 5) Spring return (if required). 6) Mounting accessories (if required), see page 74. 7) Special modifications (if required).

SERIES P MODEL NUMBERS. Each Series P cylinder can be specified by use of symbol numbers to develop a model number from the chart below. Select only those symbols that represent the cylinder features desired, and place them in the sequence indicated by example at top of chart. The example shown is a 2½" bore, cushion head end, double rod cylinder, P SERIES, with Viton seals, standard diameter rod and threads, cushion cap end—6" stroke. A 2" bore cylinder with O-Ring piston, no cushions, standard seals and standard rod bearing, 4" stroke would be indicated as 2-P16 x 4.

SAFETY CUSHION ADJUSTMENT LOCATION



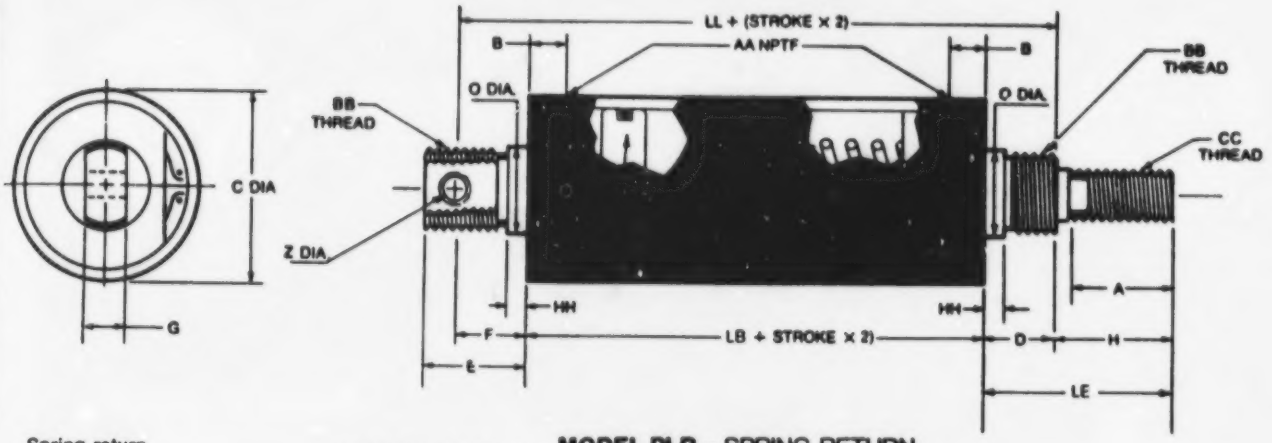
With port in position 1, cushion location will be position 4

BORE SIZE	CUSHION HEAD END	DOUBLE ROD	SERIES	PISTON	COMMON MODIFICATION	SPECIAL	ROD DIAMETER NUMBER	ROD THREAD STYLE NUMBER	CUSHION CAP END	STROKE
2½"	C	K	P	L	V	S	1	6	C	X6"
Specify 1 1/8", 1¾", 2", 2½", 3", 4"	Use "C" Symbol ONLY if cushion at rod end is required	Use "K" Symbol ONLY if double rod cylinder is required	Series Symbol used on all Series P, cyls. ("O" ring piston supplied as std.)	Use "L" Symbol ONLY if Lipseal piston is required	If req'd. specify any one or combination of symbols V = Viton Seals N = No Tang E = Spring Extend R = Spring Return A = Dual Tang Mounting	Use "S" symbol only if special feature is req'd. (specify) NOTE: do not use symbol "S" for Rod End Modifications	Specify: • 1-standard • 0-special (specify diameter) (For double rod cylinders, specify rod code twice)	Specify: • 6-Standard • 3-special (for special rod end specify "CC" thread dia. A and LE or LE_1 dim. or submit sketch)	Add "C" Symbol ONLY if cushion at cap end is required	Specify in inches. (show times symbol "X" just ahead of stroke length

NOTE: Cataloged standard piston rod end (Style 16) will be supplied unless otherwise specified.

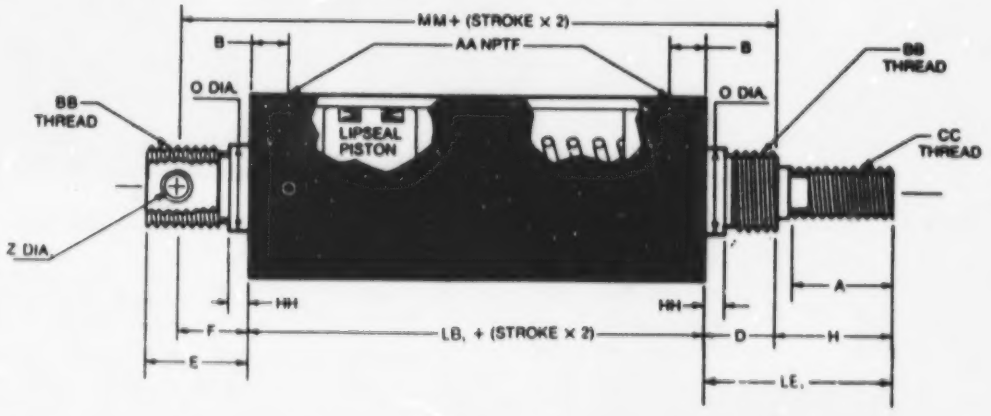
Spring Return or Extend Cylinders
Models PR and PE • 150 psi air
Models PLR and PLE • 150 psi air

O-RING PISTON — MODEL PR – SPRING RETURN / MODEL PE – SPRING EXTEND



Spring return cylinders are available without tail section covered by dimension E minus HH at no extra charge. To order, add letter "N" to model number.

LIPSEAL PISTON — MODEL PLR – SPRING RETURN / MODEL PLE – SPRING EXTEND



Mounting nuts not supplied with cylinder. See page 74 for mounting nuts & assessories.

DIMENSIONS FOR SINGLE ROD SPRING RETURN CYLINDERS UP TO 6" STROKE* (NO LOAD SPRING)

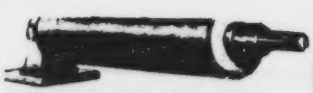
BORE	ROD DIA.	LB	LB,	B	C	D	E	F	G	H	A	O	Z	AA	BB	CC	HH	LL	MM	LE
1¼	⅜	2⅛	3⅛	13/32	1⅜	⅝	1	1⅛	⅜	1	⅞	¾	¼	⅛	¾-16	⅜-16	3/32	3⅜	4⅜	1⅛
1½	½	2⅛	3⅜	½	1⅜	⅜	1¼	⅞	½	1⅜	1¼	1⅛	3/16	¼	1-14	½-13	⅛	4⅜	5⅜	2⅛
2	⅝	2⅛	3⅜	½	2¼	⅜	1¼	⅞	½	1⅜	1¼	1⅛	3/16	¼	1-14	⅝-11	⅛	4⅜	5⅜	2⅛
2½	¾	2⅛	3⅜	⅝	2¾	1	2	1⅜	⅝	1⅞	1½	1⅜	3/16	⅜	1⅜-12	¾-10	3/16	5¼	6¼	2⅛
3	¾	2⅛	3⅜	⅝	3¼	1	2	1⅜	⅝	1⅞	1½	1⅜	3/16	⅜	1⅜-12	¾-10	3/16	5¼	6¼	2⅛
4	1	Δ	5⅜	15/16	4⅜	1⅛	2⅛	1⅜	¾	2¼	1⅜	1¾	½	½	1¾-12	1-14	3/16	Δ	7 15/16	3⅛

Δ 4" bore spring return cylinders, available only with Lipseal Type Piston.

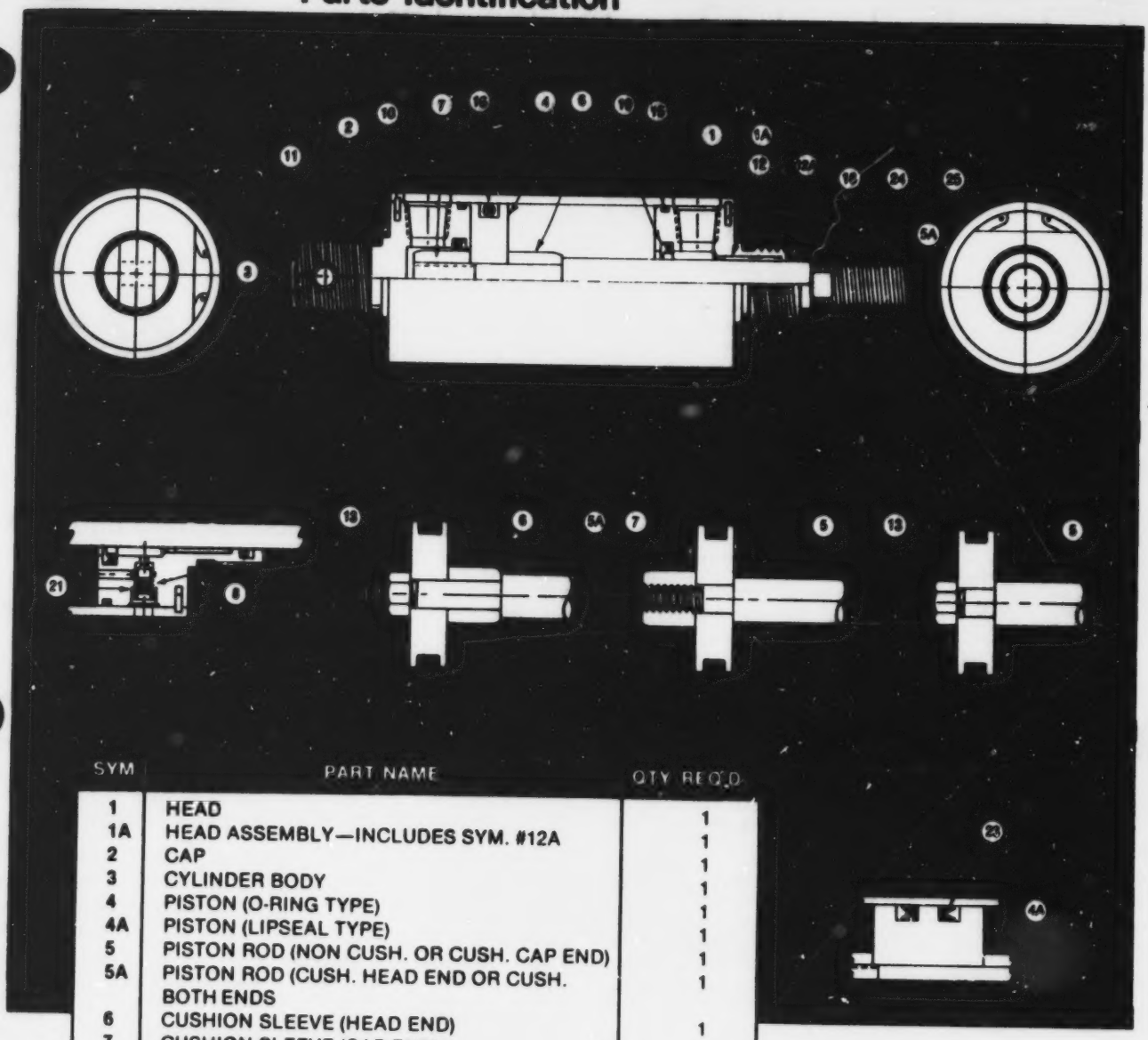
VITON SEALS for operation to 300°F are available at extra cost. Specify model PRV, PEV, PLRV or PLEV.

* Dimensions shown are for cylinder with no load spring. For heavier springs or double rod spring return cylinders, consult factory.

Viton seals may be used at 400°—500°F at slightly lower pressures.



Series P Cylinders
Parts Identification



SYM	PART NAME	QTY REQ'D
1	HEAD	1
1A	HEAD ASSEMBLY—INCLUDES SYM. #12A	1
2	CAP	1
3	CYLINDER BODY	1
4	PISTON (O-RING TYPE)	1
4A	PISTON (LIPSEAL TYPE)	1
5	PISTON ROD (NON CUSH. OR CUSH. CAP END)	1
5A	PISTON ROD (CUSH. HEAD END OR CUSH. BOTH ENDS	1
6	CUSHION SLEEVE (HEAD END)	1
7	CUSHION SLEEVE (CAP END)	1
8	CUSHION ADJUSTMENT NEEDLE VALVE	*
10	RETAINING RING	2
11	BUSHING	1
12	ROD BEARING—FITS SYM. #1 ONLY	1
12A	ROD BEARING—SEE SYM. #1A	**
13	PISTON RETAINING NUT	1△
15	END SEAL	2
16	PISTON O-RING SEAL	1
18	ROD WIPER SEAL	1
19	CUSHION CHECK SEAL	*
21	NEEDLE VALVE O-RING	*
23	PISTON LIPSEAL	2
24	ROD O-RING—FITS SYM. #1A ONLY	1
25	ROD B.U. WASHER—FITS SYM. #1A ONLY	1

* 1 PC. REQ'D PER CUSHIONED END △ REQ'D ONLY ON NON CUSH. OR CUSH. HEAD END CYL.
**NOT AVAILABLE SEPARATELY

07 / 17	G	1	1	A
Series	Mist / Micro-Mist	Combination Form	Port Size	Filter Bowl & Drain Options	Filter Element

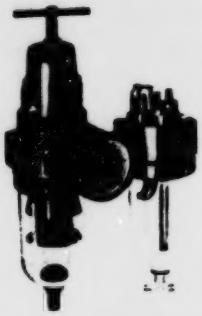
Series	Mist	Micro-Mist
Miniature, ⅛"-¼"	04	N/A
Compact, ¼"-⅜"	06	16
Standard, ¼"-⅜"-½"-¾"	07	17

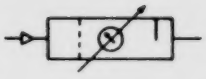
Combination Form
- G - 2 Piece Filter/Regulator (Piggyback)-Lubricator

Port Size
- 0 - ⅛"
- 1 - ¼"
- 2 - ⅜"
- 3 - ½"
- 4 - ¾"

Filter Bowl & Drain Options
1. Poly Bowl/Manual Drain
2. Poly Bowl/Bowl Guard/Manual Drain
3. Metal Bowl/Manual Drain
4. Metal Bowl/Sight Gauge/Manual-Drain
5. Poly Bowl/Auto Drain
6. Poly Bowl/Bowl Guard/Auto Drain
7. Metal Bowl/Auto Drain
8. Metal Bowl/Sight Gauge/Auto Drain

Filter Element
- A - 40 Micron
- B - 5 Micron
- C - 25 Micron





Two-Unit Combinations — with Gauge

Description	Port Size	Combination Number: Mist	Combination Number: Micro-Mist	Consisting of: Filter/Regulator	Consisting of: Mist Lubricator	Consisting of: Micro-Mist Lubricator
Filter — Poly Bowl – Manual Drain **Regulator —** 0-125 Adjustment and 0-160 Gauge **Lubricator —** Poly Bowl — Manual Drain	⅛	04G01B18F0B	N/A	04E01B18F	04L00B	N/A
	¼	04G11B18F0B	N/A	04E11B18F	04L10B	N/A
	¼	06G11A18A1B	16G11A18A1B	06E11A18A	06L11B	16L11B
	⅜	06G21A18A1B	16G21A18A1B	06E21A18A	06L21B	16L21B
	¼	07G11A18A1B	17G11A18A1B	07E11A18A	07L11B	17L11B
	⅜	07G21A18A1B	17G21A18A1B	07E21A18A	07L21B	17L21B
	½	07G31A18A1B	17G31A18A1B	07E31A18A	07L31B	17L31B
	¾	07G41A18A1B	17G41A18A1B	07E41A18A	07L41B	17L41B
Filter — Poly Bowl — Automatic Drain **Regulator —** 0-125 Adjustment and 0-160 Gauge **Lubricator —** Poly Bowl — Manual Drain	⅛	04G05B18F0B	N/A	04E05B18F	04L00B	N/A
	¼	04G15B18F0B	N/A	04E15B18F	04L10B	N/A
	¼	06G15A18A1B	16G15A18A1B	06E15A18A	06L11B	16L11B
	⅜	06G25A18A1B	16G25A18A1B	06E25A18A	06L21B	16L21B
	¼	07G15A18A1B	17G15A18A1B	07E15A18A	07L11B	17L11B
	⅜	07G25A18A1B	17G25A18A1B	07E25A18A	07L21B	17L21B
	¾	07G35A18A1B	17G35A18A1B	07E35A18A	07L31B	17L31B
		07G45A18A1B	17G45A18A1B	07E45A18A	07L41B	17L41B
Filter — Metal Bowl — Sight Gauge — Manual Drain **Regulator —** 0-125 Adjustment and 0-160 Gauge **Lubricator —** Metal Bowl — Sight Gauge — Manual Drain	*⅛	04G03B18F3B	N/A	04E03B18F	04L03B	N/A
	*¼	04G13B18F3B	N/A	04E13B18F	04L13B	N/A
	¼	06G14A18A4B	16G14A18A4B	06E14A18A	06L14B	16L14B
	⅜	06G24A18A4B	16G24A18A4B	06E24A18A	06L24B	16L24B
	¼	07G14A18A4B	17G14A18A4B	07E14A18A	07L14B	17L14B
	⅜	07G24A18A4B	17G24A18A4B	07E24A18A	07L24B	17L24B
	½	07G34A18A4B	17G34A18A4B	07E34A18A	07L34B	17L34B
	¾	07G44A18A4B	17G44A18A4B	07E44A18A	07L44B	17L44B

*Sight Gauge not available on Miniature Bowls

Note: Shaded units are not standard stock items. See pages 181-223.

Note: Combination model numbers listed are the most popular configurations. To determine individual FRL components on combinations not listed above, please refer to the combination order chart at the top.

Combination Selection Guide

18	A	1	B	★
Regulator Pressure & Gauge Options	Regulator Adjustment	Lubricator Bowl Options	Lubricator Tamperproof Options	Design Level
11 - 0-60 12 - 0-15 (04 & 05R Only) 13 - 0-125 15 - 0-250 (N/A on 04 & 05R) 16 - 0-60 With Gauge 17 - 0-15 With Gauge (04 & 05R Only) 18 - 0-125 With Gauge 21 - 0-250 With Gauge (N/A on 04 & 05R)	A - T-Handle/Relieving B - Knob/Relieving E - Knob/Bal. Poppet/ Relieving F - Knob/Unbal. Poppet/ Relieving G - Knob/Unbal. Poppet/ Non-Relieving L - T-Handle/Non-Relieving M - Knob/Non-Relieving Y - Knob/Bal. Poppet/ Non-Relieving	0 - Poly Bowl/Manual Drain (04L Only) 1 - Poly Bowl/Manual Drain 2 - Poly Bowl/Bowl Guard/ Manual Drain 4 - Metal Bowl/Sight Gauge/ Manual Drain 5 - Poly Bowl/Pressure Fill 6 - Poly Bowl/Bowl Guard/ Pressure Fill 8 - Metal Bowl/Sight Gauge/ Pressure Fill	A - With Tamperproof Cap B - Without Tamperproof Cap E - Pressure Fill in Body/ With Tamperproof Cap F - Pressure Fill in Body/ Without Tamperproof Cap	Entered in model number at factory.

Two-Unit Combinations — with Gauge

Description	Port Size	Combination Number: Mist	Combination Number: Micro-Mist	Consisting of: Filter/ Regulator	Consisting of: Mist Lubricator	Consisting of: Micro-Mist Lubricator
Filter — Metal Bowl — Automatic Drain **Regulator —** 0-125 Adjustable and 0-160 Gauge **Lubricator —** Metal Bowl — Sight Gauge — Manual Drain	* ⅛	04G07B18F3B	N/A	04E07B18F	04L03B	N/A
	* ¼	04G17B18F3B	N/A	04E17B18F	04L13B	N/A
	¼	06G17A18A4B	16G17A18A4B	06E17A18A	06L14B	16L14B
	⅜	06G27A18A4B	16G27A18A4B	06E27A18A	06L24B	16L24B
	¼	07G17A18A4B	17G17A18A4B	07E17A18A	07L14B	17L14B
	⅜	07G27A18A4B	17G27A18A4B	07E27A18A	07L24B	17L24B
	½	07G37A18A4B	17G37A18A4B	07E37A18A	07L34B	17L34B
	¾	07G47A18A4B	17G47A18A4B	07E47A18A	07L44B	17L44B
Filter — Poly Bowl — Bowl Guards — Manual Drain **Regulator —** 0-125 Adjustment and 0-160 Gauge **Lubricator —** Poly Bowl — Bowl Guard — Manual Drain	¼	06G12A18A2B	16G12A18A2B	06E12A18A	06L12B	16L12B
	⅜	06G22A18A2B	16G22A18A2B	06E22A18A	06L22B	16L22B
	¼	07G12A18A2B	17G12A18A2B	07E12A18A	07L12B	17L12B
	⅜	07G22A18A2B	17G22A18A2B	07E22A18A	07L22B	17L22B
	½	07G32A18A2B	17G32A18A2B	07E32A18A	07L32B	17L32B
	¾	07G42A18A2B	17G42A18A2B	07E42A18A	07L42B	17L42B
Filter — Poly Bowl — Bowl Guard — Automatic Drain **Regulator —** 0-125 Adjustment and 0-160 Gauge **Lubricator —** Poly Bowl – Bowl Guard — Manual Drain	¼	06G16A18A2B	16G16A18A2B	06E16A18A	06L12B	16L12B
	⅜	06G26A18A2B	16G26A18A2B	06E26A18A	06L22B	16L22B
	¼	07G16A18A2B	17G16A18A2B	C7E16A18A	07L12B	17L12B
	⅜	07G26A18A2B	17G26A18A2B	07E26A18A	07L22B	17L22B
	½	07G36A18A2B	17G36A18A2B	07E36A18A	07L32B	17L32B
	¾	07G46A18A2B	17G46A18A2B	07E46A18A	07L42B	17L42B

*Sight Gauge not available on Miniature Bowls

Note: Shaded units are not standard stock items. See pages 181-223.

Note: Combination model numbers listed are the most popular configurations. To determine individual FRL components on combinations not listed above, please refer to the combination order chart at the top.

Features:

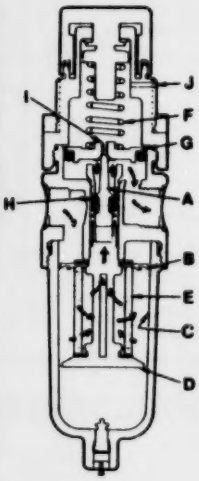
- Excellent water removal efficiency.
- Solid control piston for extended life.
- Space saving package offers both filter and regulator features in one integral unit.
- Non-rising adjustment knob.
- Two full flow ⅛" gauge ports.

Application:

The Parker 04E series miniature filter/regulator "Piggybacks" combine the fine features of the miniature filter and regulator into an integral space saving package. They are designed to provide minimum pressure drop over a wide operating range, and feature a solid control piston for significantly longer life. With a non-rising adjustment knob as standard, this series offers an economical and attractively styled alternative.

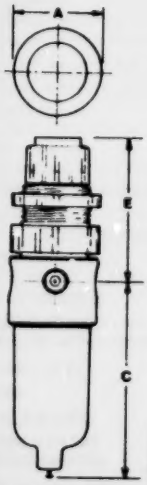
Filter/Regulator Selection:

1. Determine maximum system flow requirements.
2. Determine maximum allowable pressure drop at rated flow in SCFM.
3. Refer to flow chart and select filter/regulator by choosing curve that offers minimum pressure drop at desired flow in SCFM.



Operation:

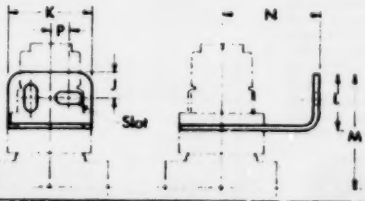
Turning the adjusting knob clockwise applies a load to control spring (F) which forces control piston (G) and valve poppet assembly (A) to move downward allowing filtered air to flow through the seat area (H) created between the poppet assembly and the seat. "First stage filtration". Air pressure supplied to the inlet port is directed through deflector plate (B) causing a swirling centrifugal action forcing liquids and coarse particles to the inner bowl wall (C) and down below the lower baffle (D) to the quiet zone. After liquids and large particles are removed in the first stage of filtration "second stage filtration" occurs as air flows through element (E) where smaller particles are filtered out and retained. The air flow now passes through seat area (H) to the outlet port of the unit. Pressure in the downstream line is sensed below the control piston (G) and offsets the load of spring (F). When downstream pressure reaches the set-point, poppet valve assembly (A) and control piston (G) move upward closing seat area (H). Should downstream pressure exceed the desired regulated pressure, the excess pressure will cause the control piston (G) to move upward opening vent hole (I) venting the excess pressure to atmosphere through the hole in the bonnet (J). (This occurs in the standard relieving type regulator only.)



Materials of Construction:

BODY: Aluminum. **BONNET, KNOB, PISTON, STEM, SEAT, HOLDER AND DEFLECTOR:** Plastic.
FILTER ELEMENT: 5 Micron Plastic, 40 Micron Plastic. **SEALS:** Buna N. **SPRINGS:** Steel.
BOWLS: Polycarbonate and Zinc.

Dimensions:



Mounting Bracket

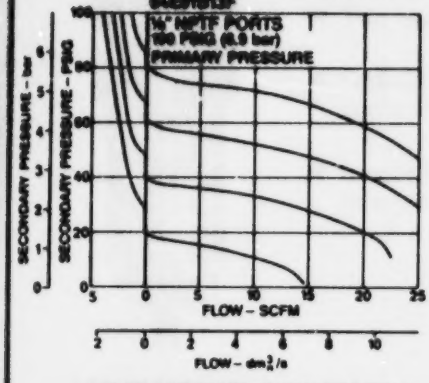
1.218 Dia. (31mm) hole required for panel mounting

Model	Port Size (NPT)	A	C	"C" with Auto. Drain	E	WT.
04E	⅛", ¼"	1.50	3.27	3.71	2.43	.4 lb.
		38 mm	83 mm	94 mm	62 mm	.18 kg

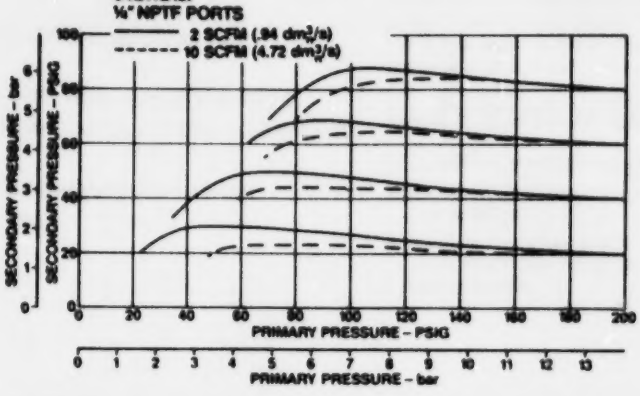
	J	K	L	M	N	P	SLOT	KIT
inches	.45	1.50	1.00	1.94	1.73	.34	.219 x .50	PS467
mm	12	38	25	49	44	9	5.5 x 12.7	

Filter/Regulator: Performance Characteristics

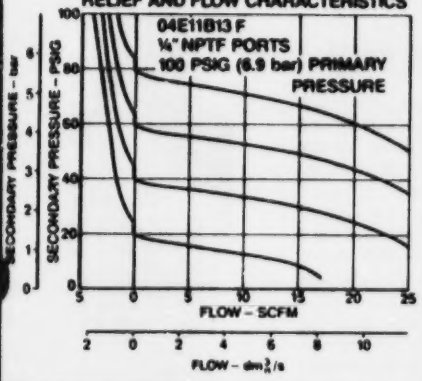
RELIEF AND FLOW CHARACTERISTICS
04E01B13F
⅛" NPTF PORTS
100 PSIG (6.9 bar)
PRIMARY PRESSURE



REGULATION CHARACTERISTICS
04E11B13F
¼" NPTF PORTS
2 SCFM (.94 dm³/s)
10 SCFM (4.72 dm³/s)



RELIEF AND FLOW CHARACTERISTICS
04E11B13 F
¼" NPTF PORTS
100 PSIG (6.9 bar) PRIMARY PRESSURE



Specifications:

PORT THREADS:
⅛ and ¼ NPTF (Filter)

GAUGE PORTS:
Two ports – ⅛ NPTF
(Can be used for full flow)

SECONDARY PRESSURE RANGES:
Standard pressure 2-125 PSIG
(.3 to 8.6 bar)
Medium pressure 1-60 PSIG
(.07 to 4 bar)
Low pressure 1-15 PSIG (.07 to 1 bar)

PRESSURE AND TEMPERATURE RATINGS:
(Polycarbonate)
150 PSI at 125°F (10.3 bar at 52°C)
(Metal)
250 PSI at 175°F (17 bar at 80°C) or less

BOWLS AVAILABLE:
Transparent polycarbonate
Metal bowl without sight gauge

BOWL CAPACITY:
1 ounce

FILTER ELEMENTS:
5 Micron standard
40 Micron optional

DRAINS:
Manual or automatic drain

Ordering Information:

04E	1	1	B	18	F	*

Port Size
0 ⅛" NPTF
1 ¼" NPTF

Bowl Options
Polycarbonate Bowl
1. Manual Drain
5. Automatic Drain
Metal Bowl
3. Metal bowl with manual drain
7. Metal bowl with automatic drain

Elements
A. 40 Micron
B. 5 Micron

Pressure Range & Gauge Options
13 125 PSI
18 125 PSI with Gauge

Type
F Unbalanced, Relieving
G Unbalanced, Non-Relieving

Accessories:

Model	04E
Polycarbonate Bowl Kits	
Manual Drain	PS405
Automatic Drain	PS406
Metal Bowl Kits	
Manual Drain	PS447
Automatic Drain	PS448
Filter Element Kits	
40 Micron	PS401
5 Micron	PS403
5 Micron Cartridge Kit	PS407
Mounting Bracket Kit with	
Panel Mount Nut	PS417
Panel Mount Nut	P78652
Piston Kits	
Non-relieving	PS411
Relieving	PS412
Gauges	
60 PSI	P530154
200 PSI	P77413
Poppet Kits	
Unbalanced Poppet	PS414
Springs	
1-60 PSI Range	P78860
2-125 PSI Range	P78848
1-15 PSI Range	P78858
Bonnet Tamperproof Lock Ring (non-adjustable field conversion)	P78754

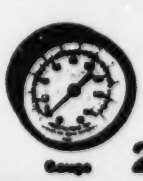
NOTE: Shaded units are not standard stock items.
*Engineering Change Designator. Will be entered at factory.

CAUTION:
Polycarbonate bowls, being transparent and tough, are ideal for use with Filters and Lubricators. They are suitable for use in normal industrial environments, but should not be located in areas where they could be subjected to direct sunlight, an impact blow, nor temperatures outside of the rated range. As with most plastics, some chemicals can cause damage. Polycarbonate bowls should not be exposed to chlorinated hydrocarbons, ketones, esters and certain alcohols. They should not be used in air systems where compressors are lubricated with fire-resistant fluids such as phosphate ester and di-ester types.

Metal bowls are recommended where ambient and/or media conditions are not compatible with polycarbonate bowls. Metal bowls resist the action of most such solvents, but should not be used where strong acids or bases are present or in salt laden atmospheres. Consult the factory for specific recommendations where these conditions exist.

TO CLEAN POLYCARBONATE BOWLS USE MILD SOAP AND WATER ONLY! *DO NOT* use cleansing agents such as acetone, benzene, carbon tetrachloride, gasoline, toluene, etc., which are damaging to this plastic.

Panel Mount Nut


Gauge

Parker Fluidpower

Features:

- Transparent sight dome for 360° visibility.
- Two large fill ports for quick filling.
- Pick-up tube with filter screen prevents contamination and helps to reduce downtime.
- Proportional oil delivery over a wide operating range.

Application:

Parker 04 miniature series mist lubricators are designed for use where space is limited and flow requirements range from 0.8 to 15 SCFM. This unit provides two fill ports and features proportional oil delivery over the entire operating range.

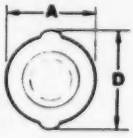
Lubricator Selection:

1. Determine maximum system flow requirements.
2. Determine maximum allowable pressure drop at rated flow in SCFM.
3. Refer to flow chart and select lubricator by choosing curve that offers minimum pressure drop at desired flow in SCFM.

Operation:

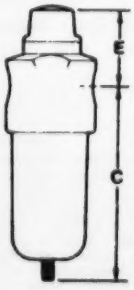
Air flowing through the unit goes through two paths. At low air flow rates, the majority of the air flows through venturi section. The rest of the air slightly deflects and flows by the restrictor disc. The velocity of the air flowing through the venturi section creates a pressure drop at throat section. This lower pressure allows oil to be forced from the reservoir through the pickup tube, past the check ball, to the metering block assembly where the rate of oil flow is controlled by metering screw. Rotation of the metering screw in the counter clockwise direction increases the flow rate, in the clockwise direction decreases the flow rate. Oil then flows through the clearance between inner and outer sight dome where drops are formed that drip to the throat section where it is broken into fine particles and mixed with the swirling air and is carried to the venturi outlet where it joins the air by passing the restrictor disc and carries to the outlet port. As air flow rate increases, the restrictor disc deflects, allowing a greater part of the additional air to by-pass the venturi section. This assures the oil delivery rate increases linearly with increased air flow rate.

The check ball assures that when there is no oil flow the oil in the pickup tube does not return to the reservoir. The miniature 04L lubricator can only be filled when the air supply is shut off.



Materials of Construction:

BODY: Aluminum. **SIGHT DOME:** Polycarbonate. **DRAIN:** Plastic. **SEALS:** Buna N.
BOWLS: Aluminum and Zinc.

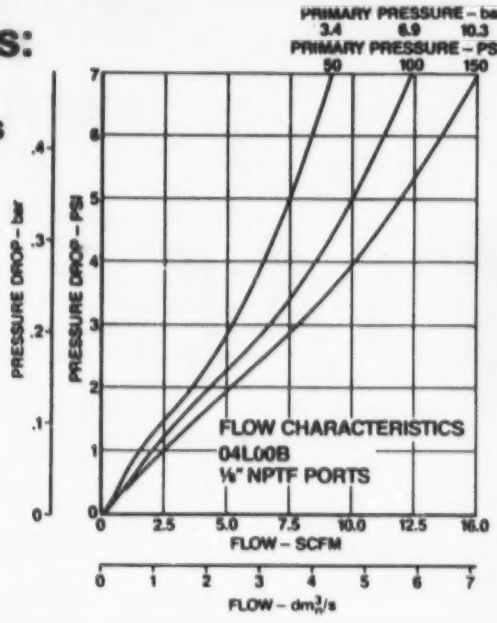


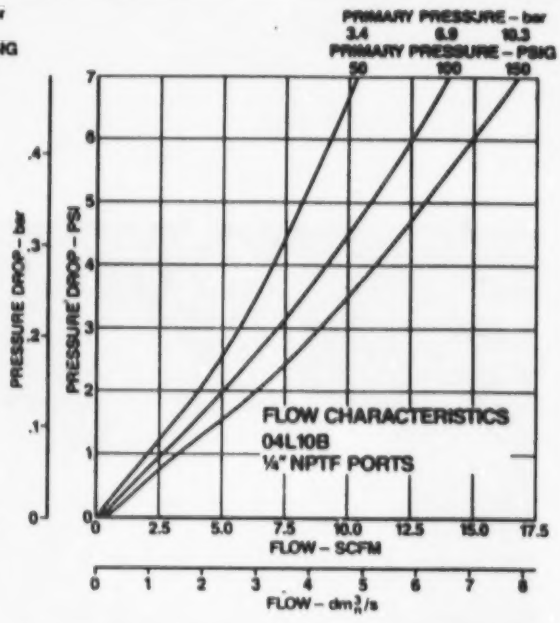
Dimensions:

Model	Port Size (NPT)	A	C	D	E	WT.
04L	⅛"-¼"	1.56	3.65	1.63	1.50	.3 lb.
		40 mm	93 mm	41 mm	38 mm	.14 kg

Lubricators:

Performance Characteristics





Specifications:

PORT THREADS:
⅛", ¼" NPTF

MINIMUM FLOW FOR LUBRICATION:
0.8 SCFM @ 100 PSI

PRESSURE AND TEMPERATURE RATINGS:
Polycarbonate transparent bowl
150 PSI at 125°F (10 bar at 52°C)

Metal bowl
250 PSI at 175°F (17 bar at 80°C) or less

SUGGESTED LUBRICANT:
Petroleum based oil of 100 to 200 SSU viscosity at 100°F and an aniline point greater than 200°F.

(DO NOT USE OILS WITH ADHESIVES, COMPOUNDED OILS CONTAINING SOLVENTS, GRAPHITE, DETERGENTS, OR SYNTHETIC OILS.)

BOWL CAPACITY:
04L – 1 ounce

DRAIN:
Manual drain standard

Ordering Information:

04L	1	0	B	*

Port Size
0 – ⅛ NPTF
1 – ¼ NPTF

Bowl Options
Polycarbonate Bowl
0 Manual Drain
Metal Bowl
3 Manual Drain

Options
B. Without Tamper-proof Cap

Engineering Change Designator
Will be entered at factory.

NOTE: Shaded units are non-standard stock items.

Accessories:

Model	04L
Polycarbonate Manual Drain Kit	PS415
Metal Manual Drain Kit	PS449
Mist Service Kit	PS418

CAUTION:
Polycarbonate bowls, being transparent and tough, are ideal for use with Filters and Lubricators. They are suitable for use in normal industrial environments, but should not be located in areas where they could be subjected to direct sunlight, an impact blow, nor temperatures outside of the rated range. As with most plastics, some chemicals can cause damage. Polycarbonate bowls should not be exposed to chlorinated hydrocarbons, ketones, esters and certain alcohols. They should not be used in air systems where compressors are lubricated with fire-resistant fluids such as phosphate ester and di-ester types.

Metal bowls are recommended where ambient and/or media conditions are not compatible with polycarbonate bowls. Metal bowls resist the action of most such solvents, but should not be used where strong acids or bases are present or in salt laden atmospheres. Consult the factory for specific recommendations where these conditions exist.

TO CLEAN POLYCARBONATE BOWLS USE MILD SOAP AND WATER ONLY! *DO NOT* use cleansing agents such as acetone, benzene, carbon tetrachloride, gasoline, toluene, etc., which are damaging to this plastic.

ROBERT BOSCH Diaphram Type Hydraulic Accumulators

Reliable, compact, high quality Robert Bosch diaphram accumulators are available for many hydraulic fluid applications up to 3000 psi.

They are ideally suited for storing energy and absorbing shocks in fluid systems. They can also be used to reduce pump size, provide emergency make-up oil, reduce cycle time and compensate for leakage and volume changes.

The diaphram, a tough, rugged elastic membrane, is firmly anchored to the inside of the shell by means of a positive-locking groove and piston ring assembly. This simple construction, coupled with rigid testing and high quality control standards, assures you of long, reliable service life.

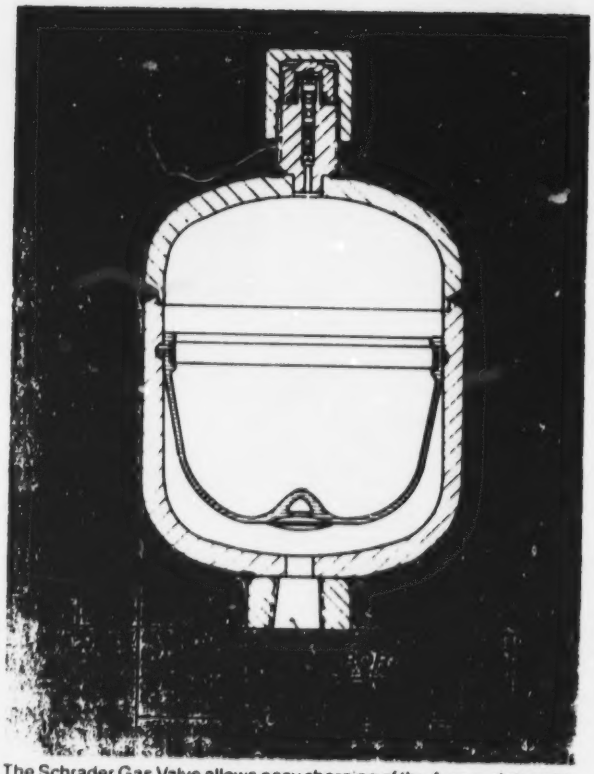
To further assure diaphram integrity, even when the diaphram is fully expanded, a shut-off button has been secured to the base to effectively close the oil port when the diaphram is at maximum distention.

The units are designed to be charged with nitrogen gas only.

Precharge Pressure: 9 X min. operating pressure

Maximum recommended ratio of working pressure to minimum operating pressure: 3 to 1

Maximum flow in both directions: 10 GPM



The Schrader Gas Valve allows easy charging of the Accumulator with Bosch Charge and Test Device No. 0 538 103 007. Other commonly used charge and test devices may also be used.

With Schrader Gas Valve

DIMENSIONS

Size in Cu. In.	Port Size*	A	B	C	D	Weight in Pounds
21	½-14NPTF	6.360	4.000	3.540	1.730	3.3
43	½-14NPTF	7.960	5.600	4.500	1.730	5.7
85	½-14NPTF	9.477	6.960	5.450	1.730	12.1
170	½-14NPTF	10.425	8.400	7.000	1.730	17.6

*Standard Ports. For accumulators with other port sizes, contact Robert Bosch Corporation.

ORDERING INFORMATION

Size in Cu. In.	Pressure PSI	Material	P/No.
21	2500	Buna N	0 531 501 533
21	2500	Buna N	0 531 501 534*
21	2500	Viton	0 531 501 513
21	2500	Butyl	0 531 501 522
43	2200	Buna N	0 531 502 553
43	2200	Buna N	0 531 502 554*
43	2200	Viton	0 531 502 536
43	2200	Butyl	0 531 502 541
43	3000	Buna N	0 531 502 635
43	3000	Buna N	0 531 502 636*
43	3000	Viton	0 531 502 620
43	3000	Butyl	0 531 502 624
85	3000	Buna N	0 531 503 628
85	3000	Buna N	0 531 503 629*
85	3000	Viton	0 531 503 616
85	3000	Butyl	0 531 503 620
170	3000	Buna N	0 531 513 613
170	3000	Buna N	0 531 513 614*
170	3000	Viton	0 531 513 616
170	3000	Butyl	0 531 513 617

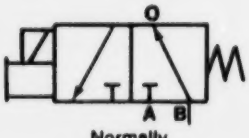
*Shell galvanized for use in water systems.

3-Way, 2-Position Single Solenoid Valve 1/4 & 3/8 Inch Ports

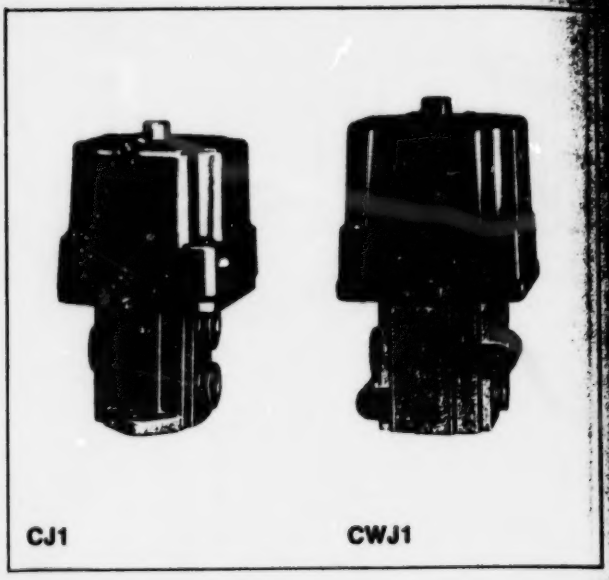
Application:
These 3-way, 2-position, direct solenoid operated, (maintained contact) spool valves are used to operate single or double acting cylinders. They can be used as normally closed or normally open, and as a 2-way.

Operation:
De-energized or spring returned position of the spool — pressure at inlet port "A" is blocked, and port "O" is connected to port "B" exhaust as a normally closed valve. Because of the area-balanced construction of the spool, either port "A" or port "B" may be used as inlet supply port. Pressure to port "A" valve is normally closed valve. Pressure to port "B" valve is normally open valve.

Normally Closed



Normally Open


CJ1 CWJ1

Operating Pressure:
0 to 150 PSI (0 to 10 bar)
Also suitable for vacuum service.

Temperature:
0°F to 160°F (–18°C to 71°C)

Model Selection Information:
Following model numbers are for 120V/60 Hz.

Port Size	Description	Model Number
¼" NPT	Base Mounted	CJ12501
⅜" NPT	Base Mounted	CJ13701

Port Size	Description	Model Number
¼" NPT	Wall Mounted	CWJ12501
⅜" NPT	Wall Mounted	CWJ13701

If different voltages are required, consult coil selection chart for appropriate last two digits in model number.

Electrical Data:

120 Volt AC, 60 Hz.13.8 Watts, 2.1 amps Inrush, .5 amp holding.

Lubrication:
Filtered and lubricated air recommended for maximum valve life and minimum maintenance.

Fill Time (Seconds)*

Valve Port Size	12 Cu. In. Test Chamber		100 Cu. In. Test Chamber	
	Fill	Exhaust	Fill	Exhaust
¼"	.027	.044	.184	.269
⅜"	.025	.040	.147	.235

*With 100 PSI supply, time required to fill from 0-90 PSI and exhaust from 100 PSI to 10 PSI is measured from instant of energizing or de-energizing 120V/60 Hz. Times shown are average.

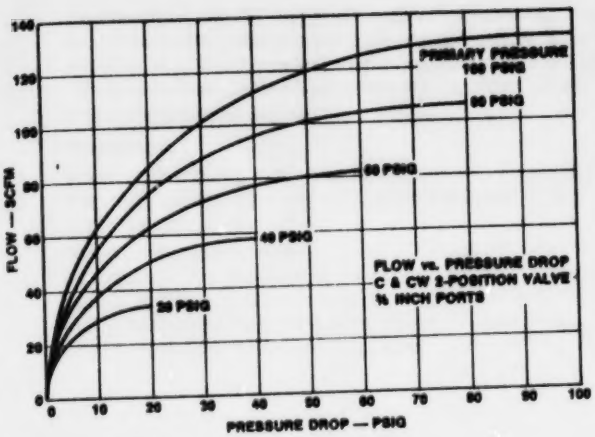
Flow Ratings (Cv)

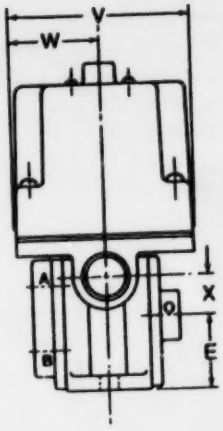
Flow Path	Valve Port Sizes	
	¼"	⅜"
A → O	2.1	2.5
O → A	2.0	2.2
B → O	1.9	2.0
O → B	2.1	2.3
Average	2.0	2.2

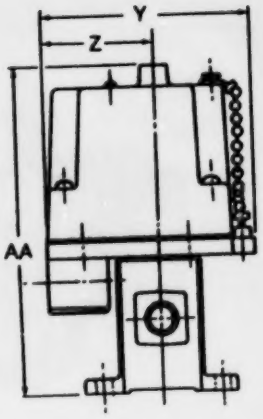
Coil Selection:

Class B	60 Hz.	50 Hz.
01	120 VAC	
02	240 VAC	
03	480 VAC	
15		110 VAC

Performance Characteristics



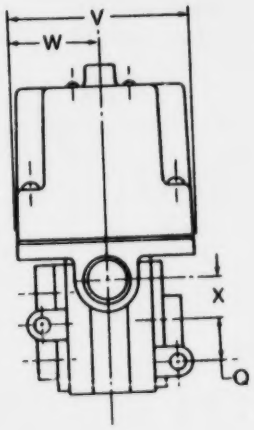


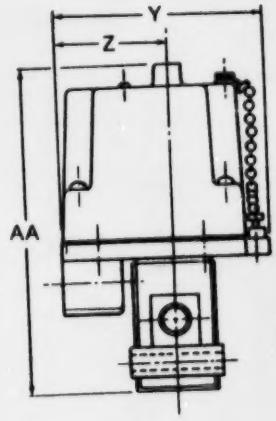


CJ1

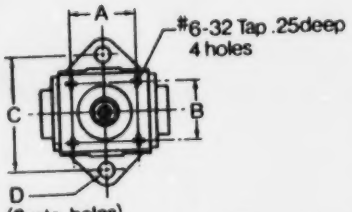
Dimensions:

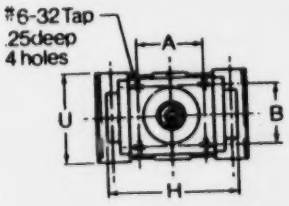
	inches	mm
A	1.19	30
B	1.06	27
C	2.06	52
D	.28D	7ϕ
E	1.28	33
F	1.12	28
G	.72	18
H	2.56	65
J	.202D	5.130ϕ
K	1.000D	25.400ϕ
L	.69	18
M	.16	4
N	2.34	59
P	.25	6
Q	.75	19
R	.50	13
S	.56	14
T	2.12	54
U	1.62	41
V	3.12	79
W	1.56	40
X	.67	17
Y	3.60	91
Z	1.94	49
AA	5.72	145

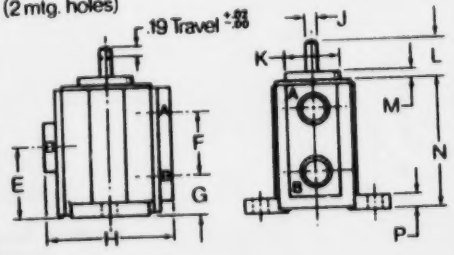




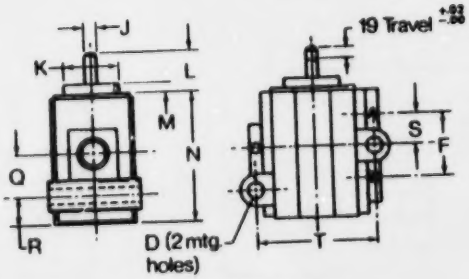
CWJ1







BASE MOUNTED VALVE BODY



WALL MOUNTED VALVE BODY

E

Application: The "S" Series Flow Control Valves are specifically designed to accurately meter the flow of air in one direction and allow free flow in the opposite direction. The "S" Series Flow Control Valves are also suitable for low pressure hydraulic service.

Operation:

When air is moving in the free flow direction through the valve, it forces the poppet off its seat and unrestricted air flow is permitted.

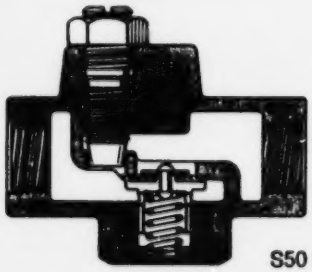
When air is moving in the metered direction through the valve, air pressure and the force of the poppet spring causes the poppet to close. Flow must then be through the orifice that is controlled by the metering screw. Opening this screw allows more flow; closing it, less flow.

Specification and Description:

Pressures up to 150 PSI air or hydraulic. Available in ¼ through ¾ inch NPTF ports.

Fine threaded, tapered metering screw provides controlled adjustment of air flow in one direction. Poppet type check valve opens to permit free and unrestricted flow in the other direction.

Valve will operate mounted in any position. Locknut on metering screw prevents change in setting during operation.

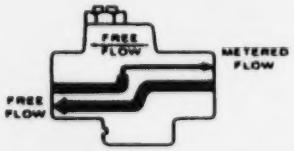


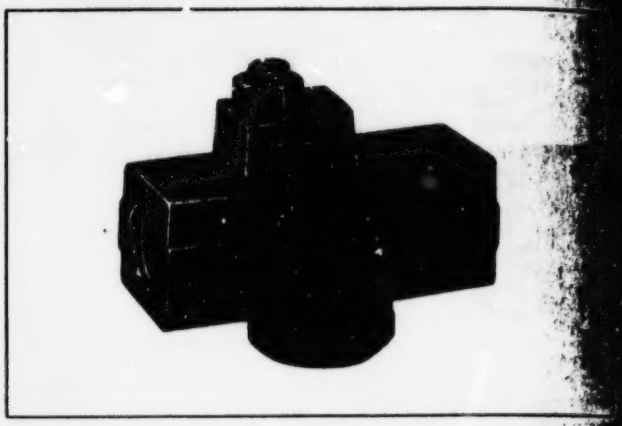
S50 Shown

Flow Rating:

Flow Path	Valve Port Size			
	¼"	⅜"	½"	¾"
Maximum Flow in Metered Direction	0 90	2 44	2 46	4 54
Maximum flow in Free Flow Direction*	1 58	3 82	4 50	8 81

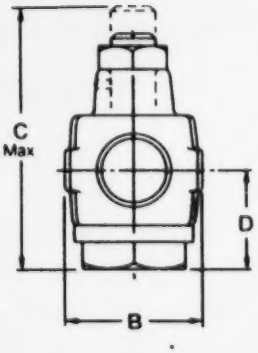
*Spring removed

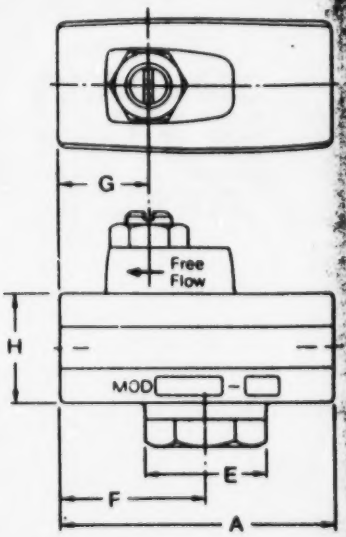




Model Selection Information and Dimensions:

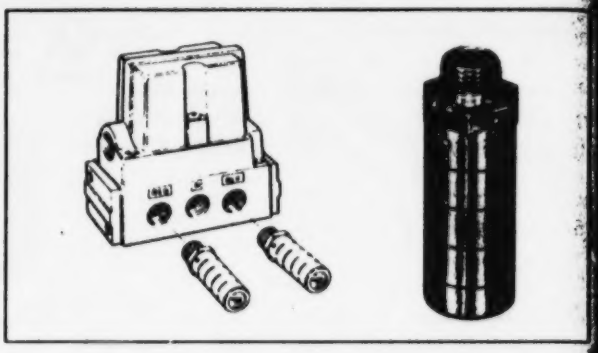
Model Number	S-25		S-37		S-50		S-75	
Pipe Size NPT	¼"		⅜"		½"		¾"	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm
A	2 41	61	3 47	88	3 47	88	4 0	102
B	1 13	29	1 56	40	1 56	40	2 0	51
C	2 39	61	3 21	82	3 21	82	3 86	98
D	78	20	1 22	31	1 22	31	1 47	37
E	94	24	1 44	37	1 44	37	1 75	44
F	1 34	34	1 91	49	1 91	49	2 13	54
G	93	24	1 25	32	1 25	32	1 34	34
H	88	22	1 25	32	1 25	32	1 63	41

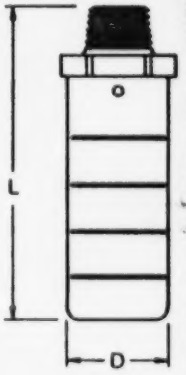




Parker Fluidpower

Application: Series ES Exhaust Port Silencers are ideally suited for use on exhaust ports of valves, and air tools. In addition to reducing noise levels, they may also be used to keep out foreign material.





Model Selection Information and Dimensions:

Model No.	ES-12M		ES-25M		ES-37M		ES-50M		ES-75M		ES-100M		ES-125F		ES-150F	
Pipe Size NPT	⅛"		¼"		⅜"		½"		¾"		1"		1¼"		1½"	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm
"D" Diameter	81	21	81	21	1 25	32	1.25	32	2 0	51	2 0	51	2 50	64	2 50	64
"L" Length	2 19	56	2 19	56	3 47	88	3 62	92	5 31	135	5 50	140	5 88	149	5 88	149

*M Series—External Thread
F Series—Internal Thread

ES Series Silencers

Port Size	Max. Flow for 90 dB without "ES" Silencer*	Max. Flow for 90 dB with Silencer
¼"	15 SCFM	45 SCFM
⅜"	5 SCFM	70 SCFM
½"	5 SCFM	110 SCFM
¾"	15 SCFM	100 SCFM
1"	15 SCFM	130 SCFM
1¼"	20 SCFM	180 SCFM
1½"	46 SCFM	220 SCFM

*Tested with 6 inch length open pipe nipple for each port size.

Tests run at Parker Hannifin Pneumatic Lab Noise readings taken with a General Radio Meter #1551C at a distance of one meter. "A" Weighting network used. Ambient noise level 58 dB Maximum.

Needle Shut-Off Valves

	Catalog Number	Tube O.D.	Pipe Thread	A	B	C	D	E	F
MALE P.T. TO MALE P.T.	108-EF		⅛×⅛	.875	1.250	.625			
	110-EF		¼×¼	.875	1.125	.750			
MALE P.T. TO FEMALE P.T.	130-EF		⅛ Male ⅛ Fem.	.875	1.250	.718	.625		
TUBE (COMPRESSION) TO MALE P.T.	168-EF	¼	⅛	1.250	1.156	.343	.718	1.031	1.375
TUBE (45° FLARE) TO MALE P.T.	103-SAE	¼	⅛	1.250	1.281	.812	.875		
	203-SAE	5/16	⅛	1.250	1.250	.812	.937		
	204-SAE	5/16	¼	1.250	1.218	.968	.937		
	303-SAE	⅜	¼	1.250	1.593	.968	1.031		
	104-SAE	¼	⅛	.875	1.281	.812	.812		
	105-SAE	¼	¼	.875	1.187	.812	.750		
	107-SAE	5/16	¼	.875	1.312	.875	.750		
	108-SAE	⅜	¼	1.250	1.750	1.062	1.062		
TUBE TO TUBE (45° FLARE)	110-SAE	¼×¼		.875	1.312	.812	.872		
	114-SAE	5/16×5/16		.875	1.312	.875	.875		
	115-SAE	⅜×⅜		1.250	1.750	1.062	1.062		

Kwik-Connect Couplers

SINGLE END SHUT-OFF TYPE BODY ONLY – Brass or Stainless Steel	Catalog Number	Pipe Thread	Tube O.D.	Material
With Poly-Flo Connection	294-PB-04		¼	B
	294-PB-06		⅜	B
	294-PBSS-04		¼	SS
	294-PBSS-06		⅜	SS
With Male P.T. Connection	298-PT-02x04	⅛	¼	B
	298-PT-04x04	¼	¼	B
	298-PT-04x06	¼	⅜	B
	298-PTSS-02x04	⅛	¼	SS
	298-PTSS-04x04	¼	¼	SS
	298-PTSS-04x06	¼	⅜	SS

SINGLE END SHUT-OFF TYPE INSERT ONLY – Brass or Stainless Steel				Used With
With Poly-Flo Connection	294-PM-04		¼	B	294-PB-04 298-PT-02x04 298-PT-04x04
	294-PM-06		⅜	B	294-PB-06 298-PT-04x06
	294-PMSS-04		¼	SS	294-PBSS-04 298-PTSS-02x04 298-PTSS-04x04
	294-PMSS-06		⅜	SS	294-PBSS-06 298-PTSS-04x06

POLY-TUBE RACK

Up to 10 tubes can be held in a compact, orderly manner with these tubing racks. Furnished in black polyethylene. Nos. 14-P, 15-P, 16-P and 17-P have grooves for Unistrut P-6000 and P-7000, or similar channel mounting. No. 26-P has grooves for Unistrut A-1000 and A-4000, or similar channel mounting.

No. 14-P Poly-Tube Rack for ¼" O.D. tubing. Has lips for fastening rack to a base with screws. Also longitudinal grooves for channel mounting.

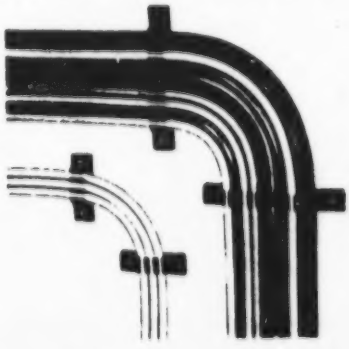
No. 15-P Poly-Tube Rack for ¼" O.D. tubing. Grooves, but no lips.

No. 16-P Poly-Tube Rack for ⅜" O.D. tubing. Lips and grooves.

No. 17-P Poly-Tube Rack for ⅜" O.D. tubing. Grooves, but no lips.

No. 26-P Poly-Tube Rack for ½" O.D. tubing. Holds 6 tubes. Lips and grooves.

"1-TO-10" TUBE RACK AND BEND HOLDER

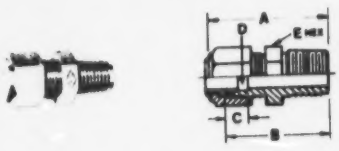


Rack can be cut quickly to size to accommodate from 1 to 10 tubes. Mounting screw holes are molded into each end of rack and also under each clip. For less than 10 tubes, rack is cut off with a knife two positions beyond last clip desired, and mounting screw hole is exposed in a convenient position. Furnished in black polyethylene.

No. 24-P Rack for ¼" O.D. tubing.

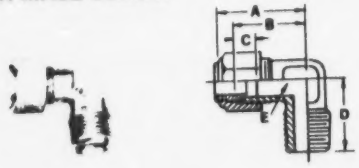
Nylo-Seal Flareless Tube Fittings

268-N MALE CONNECTOR



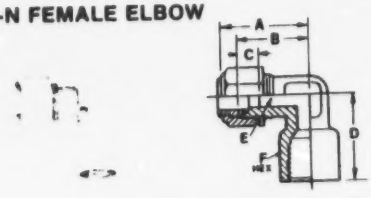
Catalog Number	Tube O.D.	Pipe Thread	A	B	C	D	E
268-N-04x02	1/4	1/8	1.406	1.000	.468	.218	.625
268-N-04x04	1/4	1/4	1.593	1.187	.468	.218	.625
268-N-05x04	5/16	1/4	1.593	1.187	.468	.281	.687
268-N-06x04	3/8	1/4	1.781	1.312	.531	.343	.812
268-N-06x06	3/8	3/8	1.781	1.312	.531	.343	.812
268-N-08x06	1/2	3/8	1.828	1.375	.593	.406	.937
268-N-08x08	1/2	1/2	2.015	1.562	.593	.406	.937

269-N MALE ELBOW



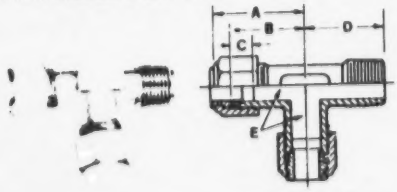
Catalog Number	Tube O.D.	Pipe Thread	A	B	C	D	E
269-N-04x02	1/4	1/8	1.156	.750	.468	.750	.218
269-N-04x04	1/4	1/4	1.156	.750	.468	.937	.218
269-N-05x04	5/16	1/4	1.218	.812	.468	1.000	.281
269-N-06x04	3/8	1/4	1.406	.937	.531	1.062	.343
269-N-06x06	3/8	3/8	1.406	.937	.531	1.062	.343
269-N-08x06	1/2	3/8	1.515	1.062	.593	1.125	.406
269-N-08x08	1/2	1/2	1.515	1.062	.593	1.312	.406

270-N FEMALE ELBOW



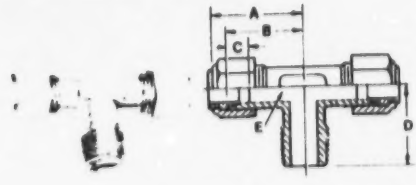
Catalog Number	Tube O.D.	Pipe Thread	A	B	C	D	E	F
270-N-04x02	1/4	1/8	1.156	.750	.468	.875	.218	.562
270-N-04x04	1/4	1/4	1.156	.750	.468	1.062	.218	.687
270-N-06x04	3/8	1/4	1.406	.937	.531	1.187	.343	.687
270-N-06x06	3/8	3/8	1.406	.937	.531	1.187	.343	.812
270-N-08x06	1/2	3/8	1.515	1.062	.593	1.250	.406	.812

271-N MALE RUN TEE



Catalog Number	Tube O.D.	Pipe Thread	A	B	C	D	E
271-N-04x02	1/4	1/8	1.156	.750	.468	.750	.218
271-N-04x04	1/4	1/4	1.156	.750	.468	.937	.218
271-N-05x04	5/16	1/4	1.218	.812	.468	1.000	.281
271-N-06x04	3/8	1/4	1.406	.937	.531	1.062	.343
271-N-06x06	3/8	3/8	1.406	.937	.531	1.062	.343
271-N-08x06	1/2	3/8	1.515	1.062	.593	1.062	.406
271-N-08x08	1/2	1/2	1.515	1.062	.593	1.312	.406

272-N MALE BRANCH TEE



Catalog Number	Tube O.D.	Pipe Thread	A	B	C	D	E
272-N-04x02	1/4	1/8	1.156	.750	.468	.750	.218
272-N-04x04	1/4	1/4	1.156	.750	.468	.937	.218
272-N-05x04	5/16	1/4	1.218	.812	.468	1.000	.281
272-N-06x04	3/8	1/4	1.406	.937	.531	1.062	.343
272-N-06x06	3/8	3/8	1.406	.937	.531	1.062	.343
272-N-08x06	1/2	3/8	1.515	1.062	.593	1.125	.406
272-N-08x08	1/2	1/2	1.515	1.062	.593	1.312	.406

282-N BULKHEAD UNION

Catalog Number	Tube O.D.	A	B	C	D	E	F	G	H
282-N-04	1/4	2.312	1.500	.468	.218	7/16–20	.625	.625	.312
282-N-05	5/16	2.437	1.625	.468	.281	1/2–20	.687	.687	.375
282-N-06	3/8	2.748	1.812	.531	.343	5/8–20	.812	.875	.375
282-N-08	1/2	2.781	1.875	.593	.406	3/4–20	.937	1.000	.312

Nylo-Seal Nylon 11 Tubing

SPECIFY CATALOG NUMBER, QUANTITY AND COLOR WHEN ORDERING

"SN" SEMI-RIGID NYLO-SEAL TUBING

Catalog Number	Tube O.D. In.	Color	Coil Length	Tube Wall Thickness In.	Burst Pressure psi	Minimum Bend Radius In.	Weight (Lbs. Per 100 Ft.)
22-SN	1/8	Natural or black	500 Ft.	.017	1500	1/2	.26
33-SN	3/16	Natural or black	350 Ft.	.024	1500	3/4	.6
44-SN	1/4	Natural or black	200 Ft.	.033	1500	1	1.0
55-SN	5/16	Natural	150 Ft.	.040	1500	1 1/2	1.5
66-SN	3/8	Natural or black	100 Ft.	.048	1500	1 3/4	2.2
88-SN	1/2	Natural or black	100 Ft.	.062	1500	2 3/8	3.2

"NSR" SEMI-RIGID NYLO-SEAL TUBING

Catalog Number	Tube O.D. In.	Color	Coil Length	Tube Wall Thickness In.	Burst Pressure psi	Minimum Bend Radius In.	Weight (Lbs. Per 100 Ft.)
22-NSR	1/8	Natural or black	500 Ft.	.026	2500	3/8	.37
33-NSR	3/16	Natural	350 Ft.	.039	2500	5/8	.81
44-NSR	1/4	Natural or black	200 Ft.	.050	2500	7/8	1.4
66-NSR	3/8	Natural or black	100 Ft.	.075	2500	1 1/2	3.19
88-NSR	1/2	Natural or black	100 Ft.	.075	2500	2 1/2	4.50

"NF" FLEXIBLE NYLO-SEAL TUBING

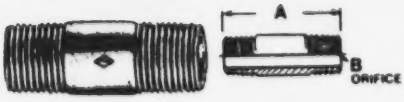
Catalog Number	Tube O.D. In.	Color	Coil Length	Tube Wall Thickness In.	Burst Pressure psi	Minimum Bend Radius In.	Weight (Lbs. Per 100 Ft.)
22-NF	1/8	Natural or black	500 Ft.	.023	1000	3/8	.33
33-NF	3/16	Natural or black	350 Ft.	.024	1000	5/8	.54
44-NF	1/4	Natural or black	200 Ft.	.033	1000	7/8	1.02
440-NF	1/4	Natural or black	200 Ft.	.040	1200	1/2	1.20
55-NF	5/16	Natural or black	150 Ft.	.040	1000	1 1/4	1.56
66-NF	3/8	Natural or black	100 Ft.	.048	1000	1 1/2	2.24
660-NF	3/8	Natural or black	100 Ft.	.060	1200	3/4	2.78
88-NF	1/2	Natural or black	100 Ft.	.062	1000	2	3.89

Brass Pipe Fittings

112-B CLOSE NIPPLE

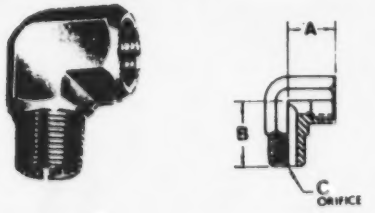
Catalog Number	Pipe Thread NPTF	A	B	C	D	E
112-B-02	1/8	.750	.265			
112-B-04	1/4	1.125	.358			
112-B-06	3/8	1.125	.422			
112-B-08	1/2	1.500	.531			

113-B LONG NIPPLE



Catalog Number	Pipe Thread NPTF	A	B	C	D	E
113-B-02x24	1/8	1.500	.265			
113-B-04x24	1/4	1.500	.358			
113-B-06x24	3/8	1.500	.500			
113-B-08x24	1/2	1.500	.625			
113-B-02x32	1/8	2.000	.265			
113-B-04x32	1/4	2.000	.375			
113-B-06x32	3/8	2.000	.500			
113-B-08x32	1/2	2.000	.625			
113-B-02x40	1/8	2.500	.281			
113-B-04x40	1/4	2.500	.375			
113-B-06x40	3/8	2.500	.500			
113-B-08x40	1/2	2.500	.625			
113-B-02x48	1/8	3.000	.281			
113-B-04x48	1/4	3.000	.375			
113-B-06x48	3/8	3.000	.500			
113-B-08x48	1/2	3.000	.625			
113-B-02x56	1/8	3.500	.281			
113-B-04x56	1/4	3.500	.375			
113-B-06x56	3/8	3.500	.500			
113-B-08x56	1/2	3.500	.625			

116-B STREET ELBOW



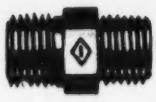
Catalog Number	Pipe Thread NPTF	A	B	C	D	E
116-B-02	1/8	.546	.812	.218		
116-B-04	1/4	.718	1.031	.312		
116-B-06	3/8	.781	1.187	.437		
116-B-08	1/2	1.171	1.437	.562		

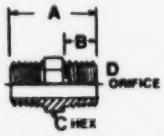
117-B PLUG

Catalog Number	Pipe Thread NPTF	A
117-B-02	1/8	.312
117-B-04	1/4	.469
117-B-06	3/8	.469

Brass Pipe Fittings

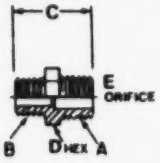
122-B HEX NIPPLE





Catalog Number	Pipe Thread NPTF	A	B	C	D	E
122-B-02	1/8	.906	.375	.437	.187	
122-B-04	1/4	1.375	.562	.562	.312	
122-B-06	3/8	1.406	.562	.687	.437	
122-B-08	1/2	1.812	.750	.875	.562	

123-B REDUCING NIPPLE

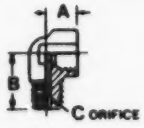


Catalog Number	A Pipe Thread NPTF	B Pipe Thread NPTF	C	D	E	F
123-B-04x02	1/4	1/8	1.190	.562	.218	
123-B-06x04	3/8	1/4	1.406	.687	.313	

124-B 45° STREET ELBOW

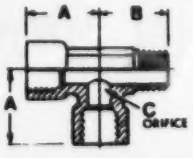
Catalog Number	Pipe Thread NPTF	A	B	C	D	E
124-B-02	1/8	.750	.687	.218		
124-B-04	1/4	.875	.781	.312		
124-B-06	3/8	1.000	.875	.406		
124-B-08	1/2	1.125	1.218	.500		

126-B ELBOW



Catalog Number	Pipe Thread NPTF	A	B	C
126-B-02	1/8	.484	.781	.125

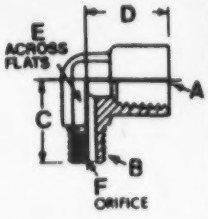
127-B TEE



Catalog Number	Pipe Thread NPTF	A	B	C
127-B-02	1/8	.750	.750	.187
127-B-04	1/4	.781	1.156	.312

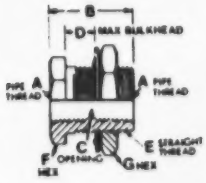
Brass Pipe Fittings

128-B REDUCING STREET ELBOW



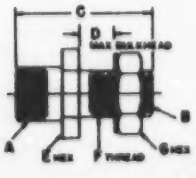
Catalog Number	A Female Pipe Thread NPTF	B Male Pipe Thread NPTF	C	D	E	F
128-B-04x02	1/4	1/8	.843	.875	.500	.218

129-B BULKHEAD ADAPTER



Catalog Number	A Pipe Thread NPTF	B Length	C	D	E	F	G
129-B-02x24	1/8	1 1/2	.328	.875	5/8–18	.875	.937
129-B-04x15	1/4	15/16	.421	.250	3/4–16	1.000	1.125
129-B-04x24	1/4	1 1/2	.421	.812	3/4–16	1.000	1.125
129-B-06x21	3/8	1 5/16	.562	.500	1–14	1.125	1.437
129-B-08x24	1/2	1 1/2	.687	.625	1 1/8–14	1.250	1.500

130-B CLAMPING STUD
Male P.T. to Male P.T. and Female P.T.



Catalog Number	A Male Pipe Thread NPTF	B Female Pipe Thread NPTF	C	D	E	F	G
130-B-08x04x35	1/2	1/4	2 5/32	.687	1.250	3/4–16	1.125
130-B-08x04x41	1/2	1/4	2 17/32	1.062	1.250	3/4–16	1.125